Help for selecting a new digital camera

Author: Mark Kaprielian
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I. Overview

The purpose of this document is to provide an overview of the types of choices you need to make when you select a digital camera. It is oriented to the "**camera enthusiast**" and "**casual**" shooter and not towards the "professional" photographer.

An important factor to keep in mind when seeking advice or being offered advice is that most of the time the person giving advice is going to recommend one specific manufacture ahead of others. This is due to a strong tendency by people that once you have selected a camera and you have decided that you like it, all your future comparisons are against the one you have. Since each manufacturer does things differently you are generally going to like the offerings from the same manufacturer because it is similar to the one you like. Think about other products you own and your preference for a particular brand.

In this document I will offer example cameras from the manufacturer that I prefer, Panasonic. For almost every camera by every manufacturer you will find a similar offering by another manufacturer. When you narrow down your choices from the examples I present in this document, I recommend that you seek out the equivalent model by the other manufacturers so you can see which attributes you are going prefer. Even if you determine that the features of a particular manufacturers model are better than another's, there's a good chance that the other manufacturer's will catch up and be better later.

There are many attributes important to photography. In this document I will attempt to provide high-level groupings of these attributes.

In general, "better" photo capabilities will mean, more expensive, heavier, and physically bigger. You will need to determine what the most important attributes are and focus on getting those at a price and physical size you will be happy with.

II. Relative Quality

Other than the skills of the person taking the photo, the two biggest factors in quality are:

- Sensor Size
- The lens

A. The most common sensor sizes

The following list shows the sensor sizes used by most manufacturers. The list is ordered from best quality to least. This also means that they are listed in order of most expensive to least.

- Full Frame
  - Best image capture quality available
  - Most expensive cameras, most expensive lenses, heaviest and largest cameras and lenses
- APS-C / Four Thirds System
  - These are considered very close in quality but the choice strongly impacts Lenses
  - APS-C lenses can be used on more cameras
  - Four Thirds lenses are much smaller and lighter than the equivalent APS-C lenses
- 1 inch
  - Recently several manufactures have released new products with this size sensor
    - See attributes of 1 over 2.3
- 1 over 2.3
  - Found in SuperZoom and pocket cameras
  - Lens cannot be changed
  - Will go from wide angle to very large zoom
  - Smaller than either of the other two size sensor cameras
  - Pocket cameras can be very small in comparison to others and some are water proof to some degree

Reference Information: The link below compares sensor sizes

http://en.wikipedia.org/wiki/File:Sensor_sizes_overlaid_inside_-_updated.svg

B. Lenses

There is a saying; even cheap lenses can look good when there's enough light

There's a fair amount of terminology that you may need to lean at some point. Here are the basic things you should know in a not very technical presentation:

- "Depth of field" or "DOF" – This is about how far in back of your subject will be in focus.
  - Example: If you took a picture of a bee on a flower, you may want everything other than the bee and the immediate area of the flower to be the only thing in focus and the rest to be blurry. This would be shallow DOF.
  - Example: If you took a picture of someone standing in front of their new car, you may want the car to be in focus as well and not blurry. This would be large DOF.
  - To get a shallower DOF you need a "faster" lens. F2.8 is faster than F5.6. When looking at "F" numbers, the smaller the number the shallower the DOF it can produce and the more expensive the lens will be.
- Fixed Lens – means that you cannot zoom it. If you want the subject larger you must get closer, smaller you must move back.
- People get Fixed Lenses mostly for specific uses. E.g. For portraits you want to get a 90mm lens. If you had a 40 mm lens you would have to get so close to the person that it would feel a

bit crowded and you would be casting shadows because you wouldn't be able to get the lights positioned to not have your body get in the way.

- Also, to technical for this document, certain "focal lengths" that is, lens mm are better for some types of shots than others, thus the 90 mm for portraits.

Reference Information: The link is an example article explaining the benefits of a Fixed lens

http://photography.tutsplus.com/tutorials/nifty-fifty-the-benefits-of-a-fixed-50mm-lens--photo-1415

C. Camera choices

Benefits of pocket cameras and SuperZooms or any other type of camera where you do not have the option of changing lenses are:

- The body of the camera is going to be smaller than one that has the same lens equivalent on it on a camera that you can change lenses
- The lenses retract into the camera making it smaller when packed or carried
- The zoom range is huge compared to any single lens you would buy
- Good/Bad is that your background will almost always be in focus. That's good if that's what you want but if you want a blurry background you're not likely to be able to make that happen.

If you choose a camera that allows you to change lenses:

- You can select lenses that are best for different scenarios
  - This means you must purchase a lens for every scenario for best results
  - You need to plan ahead and have all the lenses with you that you may need for a shoot
- You can share lenses with other cameras if they are compatible with the other camera
  - Caution: Each manufacturer has their own "lens system". In general you cannot share lenses between cameras made by different manufacturers. E.g. Nikon lenses go on Nikon cameras. Even among Nikon lenses, not all their lenses will fit on other Nikons. This is the same for other manufactures as well so you have to be very careful.
- Once you buy some lenses for your camera you are said to have "bought into that lens system". For example, you spend say $2000 for a fast lens and a general purpose (not fast lens). If and when you decided to get a second camera, if your lenses you have are not compatible then you will need to buy new lenses for the second camera. If you buy from the same manufacturer that uses the same "line of lenses" then you can share the lenses between the cameras.

III. Light

If you are going to shoot in "low light" you will not get as many usable pictures from a pocket or SuperZoom. These cameras are best for outdoors and other well light scenes. As an example my wife brings her Panasonic ZS20 pocket camera on our vacations and she is extremely happy with the quality of the photos it takes. As I mentioned earlier, when you have enough light even cheap lenses look good. Even the photos taken inside dark churches came out well.

There is a distinction between "low light" and "dark scenes"

- Taking a picture of a building at night is a dark scene.
- Low light means that there is something specific you want to take a photo of and, if you could you would turn up the lights if you could so you see the subject better, e.g. a person in a room where you would have difficulty reading a menu because it was too dark.

Pocket or SuperZoom cameras are not going to do a very good job if you are taking pictures in a dark room, such as a dance where the lights are not fully on. It will be "grainy". If the people are moving, they will be blurry. If you use a flash then you'll get a reasonable shot if you are not too far away (must be in the range specified for the flash or you have to attach another flash if you can. Pocket zooms never let you attach another flash and only some SuperZooms do. SuperZooms and

pocket cameras are best for outdoor or well-lit scenes. Be sure that you at least have a built-in flash. Keep in mind that the flash is only going to be useful for it's specified range which is usually no more than about 10 feet.

If you plan on taking many pictures in low light without the use of a flash pocket and SuperZoom cameras will just not do well. You will need to have the APS-C, Four Thirds or Full Frame cameras to do it. If you want to take pictures at parties or gatherings and you are willing to use your flash, a pocket or SuperZoom camera will give you great shots most of the time.

IV. Where are your photo's going

The following are generalizations as is much of the content of this document is:

- Poster size prints – You will need a Full Frame camera
- 800 x 600 pixel size postings to the internet - possibly

V. Selection by "post processing" effort

Post processing means adjusting your photos on your computer.

You need to make a major decision about if you are going to "shoot JPEG or shoot RAW"

All cameras will produce JPEG photos. Not all cameras will produce RAW photos

Using a definition from the internet:

> A **camera raw** image **file** contains minimally processed data from the image sensor of either a digital **camera**, image scanner, or motion picture film scanner. **Raw files** are named so because they are not yet processed and therefore are not ready to be printed or edited with a bitmap graphics editor.

Taking photos in Raw gives you a tremendous ability to adjust the photos. A classic example is if you take the same shot producing a JPEG and a RAW file in a room that is so dark you can barely see the thing you are shooting. If you try to brighten up the JPEG you are going to a lot of "noise" or "graininess". The RAW photo will can be made to appear normal and little noise will be visible.

When you shoot JPEG you are letting the camera make all the decisions about what is important in the picture and once it decides you cannot change the balance of things. RAW lets you change the balance of things in the picture and when you are done, you can save your adjusted photos as a JPEG.

If you choose to just shoot JPEG there are a number of programs out there that let you do basic manipulations. One Windows based program I recommend is ACDSee,

http://www.acdsee.com/en/products/acdsee-pro-8?gclid=Cj0KEQjwmqyqBRC7zKnO_f6iodcBEiQA9T996NhfYQ4eLSpHccXXN-1asuWCZZrz9-22Ps7Qz4ltg60aAqn38P8HAQ

If you choose to shoot RAW then I recommend LightRoom by Adobe.

http://www.adobe.com/creativecloud/photography.html?sdid=KKTJE&skwcid=AL!3085!3!69454110978!e!!g!!adobe%20lightroom%206&ef_id=VRrj9QAAAJK6sbMs:20150507175828:s

VI. Selection by Price

Price may or may not matter to you. Here is a look at things from a price consideration point of view.

Many people "step up" the level of quality they desire after they've figured out what kind of pictures they want to take. Sometimes the step up is tempered by price.

The progression of quality tracks with the progression of price

- Cell Phone – Lowest quality, lowest price
- Pocket camera or SuperZooms – About $600 to $900
- APS-C / Four Thirds System – About $500 - $1600, does not include price of lenses
- Full Frame older but not used models - About $1,600 - $2,600, does not include price of lenses

- Full Frame – About $3,000 - $4,800, does not include price of lenses

In general, the higher the quality the heavier and larger the equipment.

VII. General Discussion

You need to find the balance between the following that is best for you:

- Size - Convenience of having the camera with you
- Weight – How heavy is taking the camera with you and how tired are you going to be holding it to take photos for extended periods of time
- Quality – Sensor size
- Cost – Which relates a great deal to quality
- Effort – Shoot JPEG and let the camera do all the work for you. You do minor adjustments, Soot RAW and you have to make the decisions on every photo. LightRoom makes it easy to do fast adjustments so it is not a great burden but it also gives you the ability to make every shot as good as it can be.

There is an interesting balance point available to you and is the choice that I have made. My desire was to have the following trade-offs to find my balance of these elements:

- I need to shoot low light with people moving so I had to switch away from pocket and SuperZoom.
- I need to make the photos as good as possible because they are going to be low light so I had to switch to RAW. I use LightRoom because it was designed specifically to help photographers do what they need to do to lots of photos.
- I would love to have the quality provided by Full Frame cameras but I'm not willing to spend that money for it AND for the lenses I would need, it would be both heavy and large to carry around. The primary reason I don't go to Full Frame is the size and weight.
- If I used an APS-C size sensor camera I could get much better quality photos than the pocket and SuperZoom cameras. While not quite good enough for professionals it can still take excellent photos in most situations. However, APS-C cameras have a good/bad trade –off. Good is that you can use many of the same lenses that you can use for Full Frame cameras. Bad is that these lenses are big and heavy compared to Micro Four Thirds (MFT) lenses
- Micro Four Thirds (MFT) sensors are a little smaller than APS-C but are considered by many to be of close enough quality that it is very difficult to spot the difference. Micro Four Thirds (MFT) has a huge advantage over APS-C and Full frame lenses because the lenses for Micro Four Thirds (MFT) are remarkably smaller and thus lighter.

By selecting Micro Four Thirds (MFT) cameras you get this balance compared to other choices:

- Bigger than the small cameras but smaller than the expensive, heavy and large cameras
- Except under the most difficult situations the quality will rival that of Full Frame cameras
- Much cheaper that Full Frame but not much more than the pocket and SuperZoom cameras

VIII. Extra Feature of Digital Cameras

Most all cameras will also take Videos. Consider this ability an nice extra. The state of the art for videos both in cameras and as hand held video devices is rapidly evolving. If you are planning on doing a lot of video you are going to be happier and better off getting a decent hand held video device than using your camera.

IX. Sample Panasonic products

Manufactures are continually releasing new versions of their cameras and blending their capabilities all the time. This makes it difficult to determine to select between very closely related product lines.

Below is a sampling of the types of cameras I've been discussing. As I stated earlier, I am partial to Panasonic. You can find other makers products that are equivalent for almost all of these. There is one notable exception, currently only two companies make Micro Four Thirds (MFT) cameras, Panasonic and Olympus. There are some subtle but significant differences between the two but I will not address those here. My choice was and continues to be Panasonic for Micro Four Thirds (MFT).

- Pocket Camera – ZS40
- SuperZoom – FZ1000
- Micro Four Thirds (MFT)
  - Panasonic has four product lines and interesting blended feature models. I will limit my suggestions here to just two:
    - GX7 – Smallest physical size among all of the MFT offerings
    - GH4 – The high end MFT offering that has additional features over the GX7
- Full Frame –
  - Panasonic does not make a Full Frame camera. The leading makers with many choices are:
    - Nikon – Top models include: D4, D300S, D750
    - Cannon – Top models include: EOS 7D Mark II, EOS 5D Mark III

X. Helpful sites and links

A. Research

Always read reviews about both the camera and lenses you are thinking of buying. There are many sites that provide Reviews and some are more thorough than others. Remember, anyone can write a review and post it.

- DPReview – This is the most major place and a tremendous resource. Make use of the review and especially helpful is the side-by-side comparisons. Tip, once you build a comparison page save the URL so you don't have to start from scratch next time you come back. Be sure to just troll through the topics of the forum that has the camera you are thinking about. You will find very insightful things among the chatter. Spend time on this site every day reading up on the things of interest to you before you decide.
  - http://www.dpreview.com/

An excellent and easy to read side by side comparison site. Be sure to use this when narrowing down your choice and comparing against other makers. The link below has the camera I have now, the GX7 compared against the camera I may go to. I'm actually waiting for the next versions of both of these to be available before I will consider upgrading or buying them.

- http://cameradecision.com/compare/Panasonic-Lumix-DMC-GX7-vs-Panasonic-Lumix-DMC-GH4

Another comparison site that is handy for seeing the cameras side by side for size is:

- http://camerasize.com/

B. Where to buy

Many places sell cameras. I would recommend you buy from the major places online. Most will offer drop protection plans. I would compare prices between the places but rarely will their prices differ by more than about $20. If you find someplace much cheaper I would be cautious.

- B & H Photo - http://www.bhphotovideo.com/
- Adorama - http://www.adorama.com/
- Amazon – but check to see who is really selling the camera to you.